

An Approach of Change Impact Analysis in Web Systems

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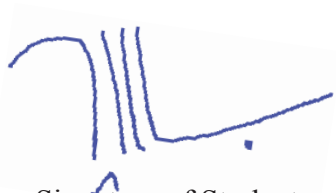
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Signature of Student:

Date: 26-03-2013

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Preface

Some of the work described in this thesis has been published previously in several conference proceedings and international journals:

1. (Mehboob, Z. et al., 2007) describes preliminary research direction, based on the investigation from the state of the art, as discussed in Chapter 2
2. (Mehboob, Z. et al., 2008) describes research investigation toward change impact analysis in Web systems and research scope based on the investigation from the state of the art, as discussed in Chapter 2.
3. (Mehboob, Z. et al., 2009) describes a comparison study and the findings from the comparison of existing architecture level CIA approaches and their relevance in Web systems, discussed in Chapter 2.
4. (Mehboob, Z. & Zowghi, D. 2009) discusses the perspectives on Architecture level Change Impact Analysis in Web Systems Evolution, leads to the findings from the state of the practices in relation to change impact analysis approaches in Web systems projects, discussed in Chapter 4.
5. (Mehboob, Z. et al., 2011) presents a Process Model of Change Impact Analysis (PMCIA) for Web Systems Using Design Knowledge. This work is discussed in Chapter 5.
6. (Mehboob, Z., 2013) presents a comparison study for PMCIA with other similar approach proposed to perform CIA for Web systems.
7. (Mehboob, Z. & Khan, A. M., 2013) presents case study design in brief and investigation results in relation to validate PMCIA, discussed in Chapter 6 and 7.

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Abstract

There are currently a high number of Web systems being developed; therefore, any consideration towards improving Web systems development practices will be worthy of research effort. Web systems are intricately interwoven into business processes so as to be supported by those systems. In other words, there are a multitude of fine-grained interconnections between business processes and the supporting architecture. Keeping in view the fine-grained interconnections, any change made in business processes can typically lead to more pervasive changes at the architecture (as compared to traditional software systems). Consequently, there is a much more fine-grained evolution at the architecture level in order to address the intricately interwoven characteristic. Partly as a consequence of the intricately interwoven characteristic, the connection between business processes and the architecture solution are also much tighter than for traditional software systems. Given this tight-connection, any change in business processes often leads to fundamental changes at the supporting architecture. Additionally, while addressing changes in business processes, a single change in architecture may have substantial impacts on other parts of the architecture and result in the ripple effects of the change being made to architecture.

The intricately interwoven characteristics, underpinning fine-grained evolution and the tight connection between business processes and the architecture design tend to differentiate Web systems from traditional software systems. To support the evolution and tight connection between business processes and architecture design, it would be beneficial to identify what needs to be modified in architecture to address business processes changes. Failure in attempts to identify change impacts on the architecture resulting from business processes changes leads to the problem where implementation (detailed design) begins before the impacts (on architecture) are adequately identified. As a consequence, many of the change impacts caused by business processes changes may go undetected or are identified very late and often lead to unnecessary re-work during the later stages of system development. We will refer to the identification of change impact on architecture before detailed design actually begins as “*early identification of change impacts*” in Web systems.

As presented in this thesis, the investigation from current state of the practices form a set of high level features/needs that a change impact analysis approach should support for Web systems. Keeping in view both the industrial perspectives and the issue where implementation (detailed design) actually begins before the change impacts (on architecture) are adequately identified, we proposed a systematic, structured and rigorous approach termed as the process model of CIA (PMCIA). We have captured various elements and necessary components derived both from the state of the art and state of the practice for the development of the process model of CIA. We have validated it with an industrial case study. The case study findings indicate that with the use of process model of CIA, practitioners indeed get support for early identification of change impacts in Web systems project and acquire an increased understanding of employing design information during change impact analysis.